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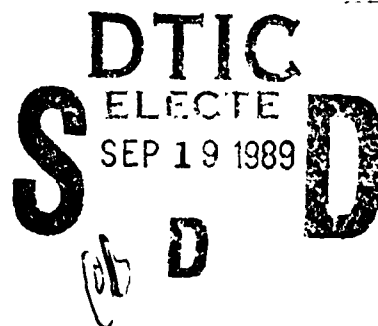
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FACILITIES ENGINEERING MANAGEMENT SYSTEM STUDY: A REVIEW OF FUNCTIONAL AREAS IN SELECTED ARMY INSTALLATION DIRECTORATES OF ENGINEERING AND HOUSING

by

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The U.S. Army Construction Engineering Research Laboratory (USACERL) was tasked by the Facilities Engineering Division, Office of the Assistant Chief of Engineers (now part of the U.S. Army Engineering and Housing Support Center) to conduct an indepth study of the Facilities Engineering Management System (FEMS), a methodology developed to manage and maintain the Army's real property. FEMS is used by Headquarters, Department of the Army; the major commands; and Army installation Directorates of Engineering and Housing (DEHs).

The overall study goals are to describe how the Facilities Engineering management process is conducted, how Facilities Engineering functions are actually carried out, and to determine what changes are needed in each functional area of the DEH.

This report presents a review of the functional areas in selected DEHs based on data collected on seven site visits using a structured interview format. The purpose of the site visits was to describe how Facilities Engineering functions are actually carried out.

The interviewers requested information about each task using five major categories: information flow and requirements, reporting requirements, resource problems, computer tools, and manual tools. General areas of concern that existed in all areas of the DEHs were identified. Specific areas of concern that the DEHs can effectively address in the short term were also identified, including: more extensive and up-to-date methods of training, more emphasis on educational programs, development of specific DEH-related computer tools, better personnel communication, restructuring the DEH to better compete with private industry at times of budget and personnel reduction, and eliminating much of the procurement bureaucracy involved in computer acquisition.

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FOREWORD

This research was performed for the Facilities Engineering Division (now part of the U.S. Army Engineering and Housing Support Center), Office of the Assistant Chief of Engineers (OACE) using Operations and Maintenance, Army (OMA) funds supplied under Funding Authorization Document (FAD) 88-080037, dated November 1987. The Technical Monitor was Mr. Homer Musselman, CEHSC-F.

The work was performed by a study team composed of researchers from the Facility Systems, Engineering and Materials, Energy Systems, and Environmental Divisions of the U.S. Army Construction Engineering Research Laboratory (USACERL). Ms. Linda McCarthy and Mr. Steven Friederich conducted site visits and provided valuable input to the project. Dr. Michael O'Connor is Chief of USACERL's Facilities Systems Division. The Technical Editor was Gloria J. Wienke, Information Management Office.

COL Carl O. Magnell is Commander and Director of USACERL and Dr. L. R. Shaffer is Technical Director.



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FACILITIES ENGINEERING MANAGEMENT SYSTEM STUDY: A REVIEW OF FUNCTIONAL AREAS IN SELECTED ARMY INSTALLATION DIRECTORATES OF ENGINEERING AND HOUSING

1 INTRODUCTION

Background

The Facilities Engineering Management System (FEMS) is the methodology by which Headquarters, Department of the Army; the major commands; and installation Directorates of Engineering and Housing (DEHs) maintain and manage the Army's real property.

An interdivisional study group of U.S. Army Construction Engineering Research Laboratory (USACERL) researchers was organized after USACERL was tasked to conduct an indepth study of the system.

The overall study goals were to describe how the Facilities Engineering management process is conducted, how Facilities Engineering functions are actually carried out, and to determine what changes are needed in each functional area of the DEH. Results of a survey conducted to define the DEHs' current automation status were published earlier.¹

In this phase of the study, DEH personnel from four continental United States (CONUS) installations were interviewed to determine the specific facilities engineering (FE) tasks performed as part of their job. The installations were Fort Sill, OK, and Fort McClellan, AL, from Training and Doctrine Command (TRADOC); Fort Bragg, NC, from Forces Command (FORSCOM); and Aberdeen Proving Ground, MD, from Army Materiel Command (AMC). This information was collected in a structured interview format that focused on task description; input, output, and resource problems for task completion; and additional computer and noncomputer improvement ideas.

Researchers also conducted similar visits to three installations outside the continental United States (OCONUS). The study team visited USASCH at Fort Shafter, HI, in Western Command (WESTCOM); and the 26th Support Group at Heidelberg, and VII Corps at Stuttgart, West Germany, in U.S. Army Europe (USAREUR). The same types of information were collected at these installations and combined with the data collected from the CONUS installations in a common data base.

Objective

This report documents data from the site visits which were conducted to identify and analyze how tasks were performed by the members of different DEH Divisions and Branches.

¹Simon Kim, et al., *Facilities Engineering Management System Study Volume I: An Automation Survey of Army Installation Directorates of Engineering and Housing*, Interim Report P-88/15, VOL I/ADA196248 (U.S. Army Construction Engineering Research Laboratory [USACERL], May 1988); Simon Kim, et al., *Facilities Engineering Management System Study Volume II: Directorate of Engineering and Housing Tasks and Systems Used*, Interim Report P-88/15, VOL II/ADA196249 (USACERL, May 1988).

Approach

The required information was obtained using a structured interview format. Each DEH organization was asked to supply information in five major categories:

1. **Information Flow and Requirements.** This category helped detail "who needs what information" to perform DEH tasks and subtasks, and how the different levels of management interact in the organizational structure of the individual DEHs.

2. **Reporting Requirements.** This category helped determine the duplication of reporting requirements and the usefulness of various reports, while providing another way to map the flow of management information.

3. **Resource Problems.** This category confirmed the feelings held by Department of the Army (DA) and several Major Commands (MACOMS), and provided insight into DA, MACOM, and installation differences in resource allocation.

4. **ADP (Automatic Data Processing).** This category provided information about computer tools used to support information management activities. It helped identify those DEH tasks that should be, but are not currently supported by ADP tools. It also provided ideas about ADP tools and improvements that could be developed for the DEH.

5. **Non-ADP.** This category provided information about additional nonautomated tools that would help the DEHs increase efficiency and productivity.

To validate the information collected during the installation site visits, researchers also conducted site visits to TRADOC, FORSCOM, and AMC headquarters. This "macro analysis" helped determine the major organizational factors that affect DEH management procedures. The Appendix contains the information from the MACOM site visits.

Report Organization

This report is divided into the 10 functional areas of a typical DEH (Figure 1). Each functional area is composed of five sections that correlate to the five major categories of information collected in the interviews.

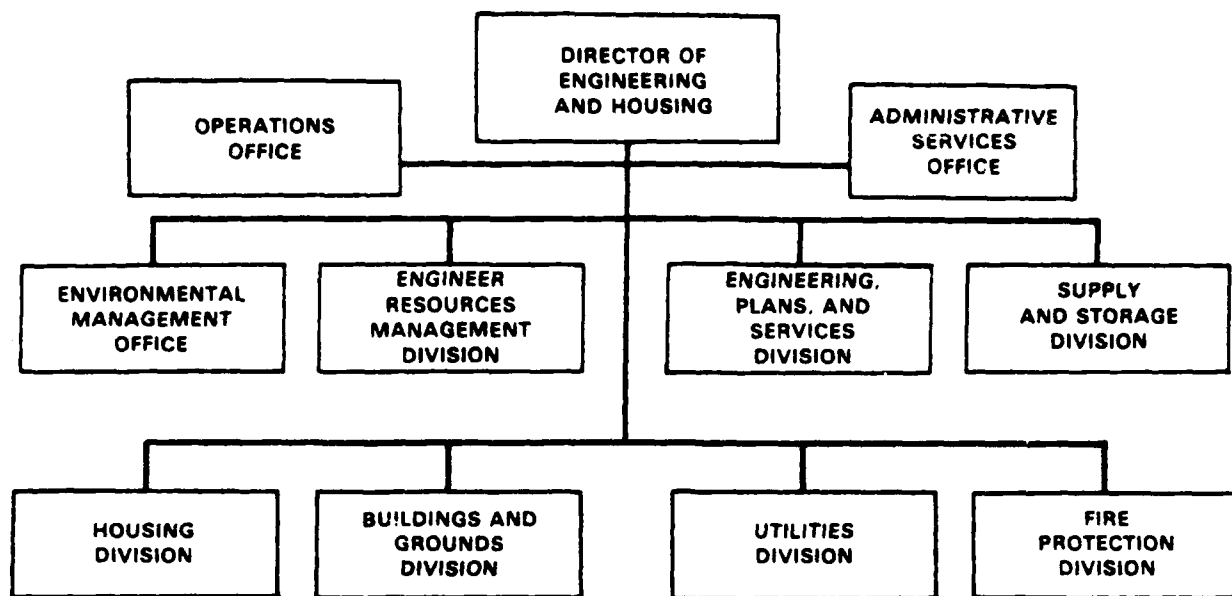


Figure 1. Organization of a typical Directorate of Engineering and Housing.

2 BUILDINGS AND GROUNDS DIVISION

The Buildings and Grounds (B&G) Division manages the maintenance, repair, and improvement of the installation's real property facilities. It provides custodial and pest control services, and manages the forestry, fish and wildlife, and land management programs--except at installations where these programs are managed by the Environmental and Natural Resource Division.

Various tasks are involved in accomplishing this mission, including:

- Planning and executing the maintenance and repair (M&R) of buildings, structures, roads, airfields, railroads, hardstands, grounds, and drainage systems,
- Providing insect and rodent control,
- Packing and crating,
- Snow removal,
- Custodial services,
- Managing, scheduling, and performing organizational maintenance of DEH equipment,
- Operating the installation Self-Help and Preventive Maintenance programs,
- Initiating M&R projects and coordinating their preparation with the Engineering Plans and Services Division,
- Administering and providing assistance in preparing contracts for contract work pertaining to the division,
- Providing technical advice and assistance to Engineer Resources Management Division for planning, programming, and budgeting for M&R of facilities, and
- Managing fish, wildlife, and land management programs.

The major management tasks include:

- Supervising and coordinating the shops (carpentry, metalwork, paint, etc.) to execute minor maintenance and repair work (service orders [SOs]), maintenance and repair projects (individual job orders [IJOs]), and routine maintenance (standing operating orders [SOOs]),
- Supervising the control, operation, and performance of organizational maintenance (inspection, service, lubrication, and minor repair) of all DEH equipment,
- Identifying, initiating, and developing technical criteria for M&R projects and providing input and review of plans and specifications to the Engineering Plans and Services Division during project development,
- Developing contract requirements (scope of work, estimate, quality control plan),
- Monitoring all division service contracts including conducting quality assurance and surveillance/evaluation of contract performance, and

- Providing requested input for the DEH annual work plan (AWP) during the planning, programming, and budgeting cycle.

The major reporting duties include:

- Daily submittal of Labor and Equipment Cards (DA 4288) by shop personnel,
- Monthly Receipt of Services Report and Daily Contract Deficiency Reports for all service contracts,
- Internal reports for input into the AWP and other Planning, Programming, Budgeting, and Execution System (PPBES) documents, and
- Pest Management Report (DD 1532) for summary of pesticides used at the installation for pest control.

Most of the M&R work performed by B&G is dictated by Army and MACOM regulations and initiated by SOs, IJOs, and SOOs received from the Engineer Resources Management Division.

The overwhelming resource problem for the division is that they do not have sufficient manpower to perform the M&R work and inspect contracted services. A secondary problem is lack of equipment (e.g., maintenance vehicles, shop tools, and mechanical handling equipment) and untimely repair and replacement of existing equipment.

Current use of ADP tools within B&G is limited. Those installations that have an Integrated Facilities System (IFS), use it to submit Labor and Equipment Cards and order supplies and materials. A few installations have developed receiving and completion reports for tracking SO work. Hawaii has an entire work management program running on a Wang minicomputer. Most installations use word processors to write general correspondence and specifications for service contracts. Some installations have implemented PAVER (a decision support system for pavement maintenance management) on a mainframe or microcomputer system.

Additional ADP tools that would be beneficial to the B&G Division are:

- Automated scheduling of organizational maintenance, preventive maintenance, and service contract inspections,
- Tracking of SO and IJO work,
- Managing the self-help inventory to determine reorder requirements,
- Generating and updating forms required for organizational maintenance,
- Managing pesticide inventory, and
- Generating 1532 reports.

Many installations expressed interest in the various Engineered Management Systems (PAVER, ROOFER, PAINTER, etc, USACERL-developed decision support systems for pavements, roofs, and paints, respectively.) to help provide better input into development of the AWP.

The non-ADP improvement cited most often was to reduce the amount of "red tape" when procuring personnel, supplies, and replacement equipment.

3 ENGINEERING, PLANS, AND SERVICES DIVISION

The Engineering, Plans, and Services (EP&S) Division provides:

- Design and engineering services,
- Supervision, inspection, and administration of project contracts,
- Installation master planning,
- Programming of major construction,
- Real property and real estate management, and
- Facilities space management.

This division is the center for engineering and contract activities associated with facilities engineering projects. It is also the focal point for development of long-range military construction plans and programs (master planning) for all funding programs and agencies.

The major tasks include:

- Developing a project scope and estimate to determine the funding category (Military Construction, Army [MCA], Minor Military Construction, Army [MMCA], Operation and Maintenance, Army [OMA], etc),
- Participating on the host installation planning board (IPB) to determine priorities,
- Submitting the priority list to MACOM,
- Developing the DD Form 1391 (when necessary),
- Monitoring the design and inspecting construction,
- Accounting for all real property and use, and
- Using real property data to develop mobilization and master planning activities.

The major management tasks include:

- Developing and monitoring engineering projects,
- Ensuring compliance with appropriate funding authorizations, and
- Maintaining and using real property inventory and use information to develop appropriate master and mobilization plans for the future (5-Year Plan).

The major reporting duties include:

- Project status,
- Real property inventories and use reports,

- Master and mobilization plans, and
- The 5-Year Plan.

Work is initiated in several ways. Work may come from a MACOM directive, stationing changes, a user developed Project Development Brochure (PDB), or from an Engineer Resources Management Division work request (ENG 4283). Master and mobilization planning is a recurring requirement of the MACOM.

The major resource problem cited was a lack of adequate manpower. Another resource problem found was a lack of automation equipment--especially Computer-Aided Drafting and Design (CADD)--and software to do project tracking, inventory, and use reports.

The most effective ADP systems currently being used are Programming, Administration, and Execution (PAX) and the 1391 Processor. Some organizations had developed their own microcomputer programs to do cost estimating and project tracking. The IFS real property and use system was criticized for not providing real-time information.

Additional ADP tools would include an integrated data base management system (DBMS) that would reflect the effect of changes in real property on the scope of work. New buildings and conversions affect computations of shortfalls during program development. ADP improvements include a switch from manual to automated design calculations, CADD capabilities, and real-time information for management decisions.

Another improvement would be to receive advance notice about future stationing plans and other decisions that have an impact on facilities. Extensive early planning would allow personnel to get out of the "put out the fires" mode. A study should be initiated to reduce the number, type, and frequency of reports since too much time is spent duplicating data.

4 FIRE PROTECTION DIVISION

The Fire Protection (FP) Division manages the installation's fire prevention and protection programs, including aircraft crash fire rescue operations. It also provides initial response to hazardous material spill operations.

Several tasks are involved in accomplishing this mission, including:

- Response to fire, aircraft crash, and hazardous spill situations,
- Training, inspecting, and investigation operations, and
- Technical review and monitoring of construction projects.

The major management tasks include:

- Preparing an AWP for recurring training, inspection, and maintenance,
- Developing mutual agreements with local fire departments, and
- Conducting a Fire Marshal program.

The major reporting duties include maintaining fire inspection reports, design review reports, training reports, and fire investigation reports.

Work is initiated in several ways. There is an annual inspection, training, and maintenance requirement based upon the AWP. In addition, FP must respond to telephone, radio, or alarm system requests for assistance. EP&S tasks FP to do technical review of predesign concepts and plans for compliance with Army Regulations and National Fire Codes.

The major resource problem cited was the lack of adequate manpower to do necessary inspection, training, and maintenance activities. Other resource problems include outdated or inadequate fire-fighting equipment, inadequate library resources on fire and hazardous materials, and a lack of ADP hardware and software for FP operations.

Some FPs are using real-time monitoring and fire alarm systems run on a dedicated minicomputer. One FP had purchased a microcomputer and was developing a building data base system. Information management has become affordable through microcomputers, and the need for FP professionals to increase productivity has never been greater. FP can computerize all recordkeeping for the department, including personnel files, training records, and service reports. Software drawing programs can generate detailed response maps. The Aberdeen Proving Ground FP suggested using CAMEO (Computer-Aided Management of Emergency Operations) to help manage hazardous material incidents with a personal computer. Non-ADP improvements to FP include improved training programs and more modern equipment.

5 UTILITIES DIVISION

The Utilities (UT) Division is tasked with assuring that adequate operational utility services are provided to the installation. This involves:

- Operation, maintenance, repair, and improvement of utility plants and systems,
- Installation, maintenance, and repair of kitchen equipment,
- Maintenance, repair, and minor construction of petroleum, oil, and lubricant (POL) storage and dispensing systems,
- Operation of solid fuel storage systems,
- Maintenance and repair of elevators, building cranes, and hoists as part of an existing utilities system, and
- Development and review of utilities projects.

The UT is also tasked with managing the installation's fixed facilities energy conservation program in coordination with the Directorate of Logistics (DOL). This involves:

- Operating energy monitoring controls systems (EMCS),
- Promoting energy awareness on the installation,
- Inspecting new and existing facilities to assure conformance with energy conservation standards and practices,
- Maintaining energy consumption records,
- Developing and reviewing energy conservation projects, and
- Monitoring progress towards Army energy consumption reduction goals.

In practice, very few installations have a UT. In some cases, the nonenergy related functions of the division have been combined with the functions of the B&G to form an Operations and Maintenance Division. In other cases, nonenergy related utilities tasks are performed by various other divisions within the DEH. Tasks related to the fixed facilities energy conservation program are usually performed by an Energy Coordinator, Energy Office, or Energy Division, depending on the size of the installation. In a few cases, these tasks are performed by a combined Environmental/Energy Division. In the discussion to follow, the term "utilities personnel" will be used to designate the personnel responsible for performing nonenergy related utilities tasks, without regard to the actual division(s) in which such personnel work. Similarly, the term "energy personnel" will be used to designate the personnel responsible for performing tasks related to the fixed facilities energy conservation program.

The planning, programming, and budgeting of utilities operations, maintenance, repair, and minor construction is a major management task performed by utilities personnel. Operation, maintenance, repair, and minor construction activities are identified based on knowledge of the general condition of existing facilities and historical performance data along with anticipated new requirements. These requirements are prioritized and placed into the 5-Year Plan wherever such prioritization warrants.

Other management tasks performed by utilities personnel include the purchase and sale of utilities and the administration of utilities contracts. The purchase of utilities involves determining the requirements for new utilities contracts; participating in the negotiations of the price, language, and length of utilities contracts; certifying utility company billings for payment; and providing utilities consumption and cost information to energy personnel on a monthly basis. Sale of utilities involves calculating utility resale rates, assisting in the development of utilities sales contracts, reading utility meters and calculating utilities usage for those activities and associations with whom utilities sales contracts have been established, estimating utilities usage where metered data are not available, and preparing the necessary documentation for utilities sales billings. Utilities contract administration involves performing the necessary technical reviews of utilities purchase and sales contracts when modifications to existing contracts are required.

The major reporting requirements for utilities personnel are generally limited to maintaining utility plant operating logs. Major reporting requirements for energy personnel include the monthly DEIS II report, the monthly commander's report, and the installation annual energy plan. Energy personnel may also be tasked to provide a monthly petroleum use report to the DOL for use in preparing the DEIS I report.

Most of the maintenance and repair work performed by utilities personnel is dictated by Army and MACOM regulations and initiated by SOs, IJOs, and SOOs.

A number of resource problems exist which are unique to utilities and energy personnel. The aging and deterioration of major utility system components appears to be a problem at many installations. Cyclic inspection of facilities to identify needed utilities repair work is performed in only a very limited number of cases due to manpower constraints.

Utilities personnel involved with utilities contracting do not always have adequate training in this area. Inadequate training of meter readers and utilities consumption data entry personnel leads to inaccuracies in data reporting. Most EMCSs used by installations are unreliable; daily breakdowns are a common complaint. Lack of a sufficient number of utility meters to provide metered use data for all utilities resale customers necessitates estimation procedures leading to a lack of incentive for energy conservation by the customers. The extent of energy awareness programs and energy conservation efforts at any given installation are highly dependent on the degree of command emphasis placed on energy related matters. This results in a great degree of variation from installation to installation in the amount of resources devoted to energy conservation programs.

Existing ADP tools currently used by utilities and energy personnel include the DD Form 1391 Processor System, ADDS, CAD systems, word processing, spreadsheets, and a few home-grown automated service order systems.

Additional ADP tools that would prove useful to utilities and energy personnel are systems that would:

- Provide for automated cyclic maintenance scheduling.
- Maintain purchase/maintenance/repair records for utility equipment by facility,
- Provide quick access to equipment parts lists,
- Coordinate the on-hand supply of repair parts to the frequency of replacement,
- Provide real-time access to the status of utilities contracts,

- Provide quick access to utilities maps and system capacities data,
- Provide real-time access to the status of utilities and energy conservation projects, and
- Provide for the full automation of utilities billings and consumption data to eliminate errors in and duplication of data entry.

Non-ADP related improvements include training programs for utilities personnel and better coordination between personnel tasked to develop utility projects and personnel planning "outyear building use."

6 HOUSING DIVISION

The Housing (HOUS) Division is tasked with providing adequate housing and furnishings to all service members and their families. Various tasks are involved in accomplishing this mission. These include:

- Determining the housing requirements and eligibility of the service member for government housing,
- Determining the availability of the numerous types of housing both on- and off-post,
- Providing service members with complete off-post housing referral services,
- Providing all residents with adequate furnishings,
- Assigning and terminating occupancy in all housing units, and
- Providing adequate training in the use of self-help facilities.

The major management tasks include:

- Planning, programming, and monitoring the execution of installation housing operations,
- Monitoring and analyzing use of all housing assets,
- Developing the annual and long range work plans, priorities, and guidance for construction, use, operation, maintenance, and repair of housing assets,
- Planning, programming, and operating the control, storage, handling, and distribution of furnishings,
- Managing and maintaining the property books for furnishings, and
- Managing the Housing Operations Management System (HOMES) and other housing ADP tools.

The major reporting duties of HOUS are the Utilization Report, which the MACOMs submit to Congress and input to the Command Operating Budget (COB). Reports on the use of all housing assets are submitted quarterly, including transient quarters occupancy data. HOUS submits its own AWP and Long Range Plan (LRP). The Budget branch prepares a 5-year financial statement and computes monthly variance reports. Three other major budget reports include the housing management, maintenance, and lease reports. The Budget branch was previously responsible for completing the Annual Housing Survey. This report has recently been replaced by the Segmented Housing Market Analysis (SHMA) report and has become a major duty of this branch. The Army Family Housing (AFH) Branch prepares construction project update reports and, in coordination with the Unaccompanied Personnel Housing (UPH) Branch, submits a Work and Service Order Completion report. The Housing Referral Branch submits the Community Housing Referral Service Report and the Community Housing Feedback Report. Every 3 months, USAREUR installations are required to submit a report describing the availability of housing (on- and off-post) that is used to predict future housing needs. However, these guidelines are not always adhered to since Command and MACOM/DA interest often dictate when families can accompany troop members. The Furnishings Branch submits an Annual Furnishings report and a report on the damage to or loss of furnishings. It submits a quarterly report on

reconciliation of stock and nonstock furnishings. The property book value report is also submitted quarterly and a log of transactions is maintained.

Other reports submitted by HOUS include:

- Contractor performance reports,
- Training accomplished and performance appraisal reports,
- Historical data reports on housing assets,
- The project execution report,
- Reports on number of in- and out-processes,
- Waiting lists for on- and off-post housing (using HOMES allows reporting of vacancies sorted by various requirements--single, double, etc),
- Problem landlord or discrimination reports,
- Reports on the diversion and conversion of housing assets,
- Reports from the various area and subarea coordinators, and
- Housing inspection reports.

Most of the major reporting duties are facilitated by HOMES and will be discussed in more detail later in this report.

The arrival of a troop member either at the beginning of a tour of duty or on temporary assignment, or a guest requesting housing quarters at the housing office is one way the performance of a housing task (assigning quarters) is initiated. Another event that initiates the performance of a task by the Housing Division is when a troop member leaves at the end of the tour. The Housing Division is responsible for terminating the troop member's "stay" in the housing facilities, and completing the compulsory inspection to verify the required condition of the unit. The efforts of the Housing Division are initiated when a problem exists with one of the housing units. A problem may have been identified in a routine preventive maintenance visit, or by a call from the resident, or may have been identified as a trend in other similar units. In any case, a SO is placed and tracked (ideally) through the DEH system by the Housing Division. Another initiator of Housing tasks is the request for more and/or different types of housing when the current assets continue to fall short of the requirements. This prompts a request from the Housing Division to the Commander and finally to the MACOM for a conversion or diversion of existing housing assets.

Numerous resource problems common to the other divisions in the DEH also exist in the Housing Division. These include lack of:

- Manpower, funding, installation-generated standing operating procedures (SOPs) and supplements to Army Regulations (ARs),
- Standard and nonstandard ADP hardware and software,
- Higher command concern that the standard systems be functional and not just a resource drain for the manager,

- Qualified programmers where adequate ADP facilities do exist,
- Access to real-time management information, and
- Effective communication between branches and divisions on a day-to-day basis.

Unique resource problems affecting the Housing Division directly are a lack of adequate housing assets including quality transient or guest quarters, and a lack of knowledge about conducting SHMA. The latter problem involves not only retraining but also some career progression for Housing staff, reflecting a lack of management concern for employee career advancement programs in this division. A vital need for automation exists in the self-help stores to maintain records of accrued expenditures for buildings--to prevent overspending on the MACOM-imposed "ceilings"--and to maintain historical data to keep accurate M&R and Contractor records on buildings. The Housing Division has been the recipient of several years of concerted efforts by the U.S. Army Engineering and Housing Support Center (EHSC) Systems Division in the development of HOMES. At the time of the first installation visits, Fort Sill and Fort Bragg were just going online and were finding HOMES extremely useful for assignments and terminations, administrative functions, furnishings management, and budget or accounting information. Personnel identified specific problems concerning the ambiguity in regulations and other documents that contradict HOMES. However, they felt that these problems would be resolved in time. Fort Shafter has its own Data Center consisting of 28 Intel 310 CPUs that run the HOMES system as one subsystem and the "home-grown" Maintenance Management and Financial Management systems as a second subsystem. They are eagerly awaiting the deployment of the Housing Referral/Survey and Furnishings modules for HOMES.

The Housing Divisions still use many Army standard systems as they await the deployment of HOMES and its numerous modules including HIMS, FESS, AMEDDPAS, JUMPS, and SLDPERS. Additional ADP tools are needed by HOUS to provide the necessary personnel with real-time access to parts of restricted data bases. This would reduce much duplication of effort caused by the current limited access. Housing Referral would be able to provide a much more sophisticated and up-to-date service if they were allowed access to real estate listings in surrounding communities. Several installations requested the Predictive Maintenance Model system, which is currently under development by USACERL, and other automated tools to help in trend analysis. Also requested were automated versions of the COB and Annual and Long Range Workplans to ease modification, online hand receipt programs, and systems to access online Master Planning information for MCA projects. Other requested ADP tools include an automated version of the SHMA, an automated data base of the installation's real property and space planning requirements, and a natural language translating system to allow troop members to make inquiries about their leases--this would be extremely useful and could save a substantial amount of money in legal fees for service members in non-English speaking countries. One of the most requested ADP tools is a system to keep track of all historical information, building data, ongoing or planned M&R projects, and MACOM- and DA-imposed funding limits for each building.

Non-ADP improvements include using Architect/Engineer (A/E) firms for life cycle cost analyses of quarters to help decide whether to repair or rebuild, and using A/E firms when the DEH cannot provide quick responses to Housing problems. Several Housing Divisions stated that there seemed to be a lack of thorough knowledge of installation level management by DA which could be rectified by DA "serving time" at the installation. Better coordination at higher levels would ensure that the communities are supported in the manner appropriate for the demands placed on them. Minimizing "micro-management" by MACOMs, which seems to be a significant problem for OCONUS installations, would allow HOUS to better conduct its business as required by regulations. Development of a Construction Management Team that would be responsible for project concept and design, specification and blueprint preparation, construction inspection, and contract tracking would also prove useful. Training

of Housing Personnel could be improved by videos of in- and out-processing, self-help duties, and other housing related issues. Conducting onsite training for Housing managers, especially furnishings managers, would improve the operation of the staff. Another noteworthy idea is the public announcement of awards, training completed, etc. This could lead to the creation by management of ladder positions for career enhancement and act as a deterrence against personnel turnover--one of the most damaging problems inherent in the DEH.

7 ENGINEERING RESOURCE MANAGEMENT DIVISION

The Engineering Resource Management (ERM) Division has the responsibility of managing the resources required in support of the Army's Real Property Maintenance Activities (RPMA). Since the costs involved in maintaining and operating the facilities at Army installations are high, it is the ERM's responsibility to make optimum use of available manpower, equipment, materials, and funding.

The general responsibilities of ERM are financial management, work management, review and analysis of work performed, and ADP systems support. Financial management activities include planning, programming, budgeting, budget execution, accounting, and review for the entire DEH. Work management includes:

- Receipt and evaluation of all work requests,
- Determination of the method of work (in-house, troop, contract, self-help),
- Coordination of administration work approval,
- Planning and estimating work to be performed by in-house forces,
- Determination and coordination of material requirements,
- Scheduling, and
- Work recording, reporting, and tracking.

In addition, ERM must perform review and analysis of completed work in order to determine methods for improvement. Cyclical inspections are also performed to determine maintenance and repair requirements. ERM provides internal ADP systems support and coordinates external ADP systems. Other miscellaneous tasks include coordination of management programs such as internal control, Quality Assurance (QA) and Army Efficiency Reviews; administration of contracts with outside agencies; and interservice support agreements within the DEH.

Major management tasks are the determination of resource requirements and preparation of the Facilities Engineer (FE) budget for inclusion in the COB, supervision of work requests to ensure timely completion and compliance with policies and regulations, and administration of the DEH budget.

Major reporting duties include preparation of the AWP, Unconstrained Requirements Report (URR), Prior Year Performance Report (PYPR), and the DEH portions of the Command Operating Budget Estimate (COBE), Budget Execution Review (BER), and Prior Year Report (PYR).

Resource problems unique to ERM are related to budget planning and execution. Lack of budget guidance and untimely information from outside organizations make it difficult to develop plans that meet the requirements imposed by the Department of Defense in support of the annual Program Objective Memorandum. Due to the uncertainty of funding levels within the DEH caused by "end of the year" money dumps, it is difficult to execute the budget as planned. In addition, reporting requirements can be difficult to meet since the data required is often scattered and hard to obtain because of the lack of integration between information resources.

Resource problems within ERM that are typical to all areas within the DEH include inadequate funding, manpower, training, and ADP equipment. Specific problems related to manpower are the lack of skilled personnel caused by wage grade levels being too low for the work required, difficulties in

hiring and promoting, lack of training opportunities, and the high turnover rate of government personnel. Shortages of ADP equipment, supplies, and support are common, along with the lack of adequate applications software.

The standard Corps-wide ADP tools are used at most installations. These include FESS, VIABLE, IFS, FEJE, PAX 1391 Processor, and STANFINS. In most cases, these systems are considered effective but their usefulness is limited because of difficulties involved in accessing the data. Hence, they are primarily used for upward reporting. Some installations have developed software applications on personal computers using commercially available packages such as DBase III, Lotus 1-2-3, and Multiplan. Most of these applications are effective since they give the users more flexibility for data manipulation, reporting, review, and analysis. However, the extent of use of these applications varies greatly from installation to installation and the effectiveness depends on the ADP skills and enthusiasm of the DEH personnel.

There is a major need for additional ADP tools to improve information management within ERM. Many manual procedures could be performed faster and more accurately through automation, including:

- Development of PC-based applications for contract status and tracking,
- Automatic forms generation,
- Project management,
- Generation of the AWP,
- Inventory control,
- Cost estimating,
- Shop scheduling, and
- Improved interfaces to Corps-wide data bases.

Non-ADP improvements suggested for ERM are typical throughout the DEH. The major ones include the need to:

- Reduce bureaucracy,
- Keep politics out of the decision-making process,
- Improve training,
- Improve planning in order to eliminate the current practice of crisis management,
- Clarify regulations,
- Reward good personnel to reduce turnover rate,
- Improve guidance from higher commands,
- Make SOPs available for new employees, and
- Involve installations in major decisions made at DA/MACOM level.

8 SUPPLY AND STORAGE DIVISION

The Supply and Storage (SS) Division is tasked with managing the supply and storage of nonstandard, DEH-unique material. It also maintains property accountability for DEH-unique equipment. If nongovernmental DEH functions are performed by contractors, the governmental functions of SS are combined with the ERM.

To accomplish their mission, SS:

- Initiates requests,
- Stores, issues, and receives turn-ins for FE supplies and materials,
- Maintains an inventory of supplies, fuels, and equipment unique to the DEH, and
- Performs maintenance on this equipment.

SS also administers contracts with delegated authorities and assists in financial inventory accounting.

The major management task for this division is to ensure that there is an adequate supply of materials and operable equipment available at all times. This includes coordinating the inventory of FE supplies, fuel, and equipment with existing requirements and supervising the distribution of supplies and material to the various shops as needed. They are also responsible for recording all of the maintenance done on DEH equipment into the Property Maintenance Book.

Reports on physical inventory, hazardous material, overage equipment, and maintenance are generated annually. Monthly reports are prepared concerning:

- Supply management,
- Excess inventory,
- Personal test results,
- Turn-in and issue,
- POL,
- DEIS-I, and
- Candidates for resupply and fuel use.

Several reports are generated daily through FESS and IFS. A quarterly stratification report is also prepared. Occasionally, a verbal report on a critical order is required.

Work for this division is initiated from many sources including shops, inspectors, customers, contractors, or the mobilization of troops. Some work is mandated by regulations, Bill Of Materials (BOM), or are recurring requirements.

Resource problems unique to this division are lack of Material Handling Equipment (MHE), the need for more FESS terminals and trained people to operate them, computerized gas pumps, and better communication lines.

Existing ADP systems include FESS, PAL, FEPB, HOMES, AMEDDPAS, SAILS, VIABLE, and a microcomputer-based system for maintenance scheduling. FESS is used at all of the installations visited and is considered effective. However, some installations do not have the current version of FESS.

Additional ADP tools that could be used by this division include a network between SS and vendors, a catalog data base of vendors and items, an optical character reader to read supply request forms (2702s), and a barcoding system for items in the warehouse.

Nonautomated improvements include:

- Security for consolidated warehouse areas with storage for gravel, sand, etc.,
- The ability to remove a vendor from the system if they repeatedly do not deliver on time,
- Allowing contractors to take equipment directly to the Property Disposal Office (PDO) for repair instead of the warehouse, and open warehouses (rather than closed),
- Reporting the status of IJOs and SOs to the Material Coordinator, and
- An increased authority limit for Blanket Purchase Agreements (BPAs).

At installations where the DEH work is contracted, the supply and storage should be placed in the hands of the contractor.

9 ENVIRONMENTAL AND NATURAL RESOURCES DIVISION

The Environmental and Natural Resources (EN) Division oversees all environmental programs for the installation and manages natural resource programs such as forestry, fish and wildlife, range conservation, agricultural outleasing, land management, and grounds maintenance. On some installations, part or all of the natural resources programs are maintained within B&G. Likewise, at some installations, the recycling and solid waste programs are managed by UT. Installation environmental programs include pollution abatement, hazardous and toxic materials management, oil and hazardous spill management, waste recycling, and installation restoration. Also, the historic preservation program and environmental assessments and impact statements are managed by this division. Overall, EN is tasked with ensuring that the installation is in compliance with Federal, State (or host nation), and Army regulations that protect natural and cultural resources, and ensuring the habitability of the environment, both on- and off-post.

Major tasks in accomplishing the environmental mission include:

- Obtaining permits for installation activities regulated by government jurisdictions (incineration, wastewater treatment, etc),
- Monitoring the handling, movement, storage, and use of hazardous materials and potential pollutants,
- Emergency responses to spills of oil and hazardous materials,
- Educating installation personnel in handling hazardous materials and in the recovery of recyclable materials,
- Inventory of valuable natural and cultural resources, and development and implementation of plans to protect these resources from adverse impacts,
- Assessing potential environmental impacts of proposed new installation activities, and
- Protecting installation lands against vegetation and soil loss and other degradation.

Major elements of the natural resource program include:

- Maintaining and enhancing forests, ranges, fish and wildlife habitat,
- Monitoring wildlife population, and setting quotas for harvesting of game animals,
- Planting, thinning, and clearing trees and other vegetation,
- Protecting and enhancing endangered species habitats, and
- Developing and implementing plans for land management, and coordinating these plans with training planners and range control.

Some installations also lease lands for grazing, hay mowing, or row crops.

Major management tasks in this division include:

- Coordination of installation Environmental and Historic Preservation Committees,
- Development of procedural plans and policies, such as the Installation Spill Contingency Plan, the Historic Preservation Plan, and the Natural Resource Management Plan, and
- Preparation of DEH budget requests.

Special budget requirements, such as endangered species or archaeological surveys, are usually coordinated directly with proponents of potentially impacting activities. Other important management tasks include monitoring contractor activities (forest harvesting, agriculture outleasing, refuse hauling, and archeological surveying) and coordinating activities with local and state regulatory authorities, such as State Environmental Protection Agencies (EPAs) and Historic Preservation Offices.

Reporting activities in EN are numerous, in part because of the many compliance related activities. Periodic reports are submitted to regulatory and permitting organizations, such as State EPAs, and Health Regulatory agencies. Quarterly reports on hazardous waste inventories and disposal are submitted to state agencies and various Army channels. Environmental assessments are completed, as needed, and reports are submitted to proponent organizations, MACOMs, public and regulatory groups, and others. Natural resource activities are summarized in the annual Natural Resources report (DA 2785).

Most actions in the environmental program are required by legislation or regulation. Major Federal legislation that guides this program includes:

- National Environmental Policy Act of 1969 (Public Law [PL] 91-190),
- Federal Water Pollution Control Act of 1972 (PL 92-500),
- Clean Air Act (PL 91-604),
- Noise Control Act of 1972 (PL 92-574),
- Resource Conservation and Recovery Act of 1976 (PL 94-580),
- Endangered Species Act of 1973 (PL 93-205),
- National Historic Preservation Act of 1966 (PL 89-665), and
- Archeological Resources Protection Act of 1979 (PL 96-95).

Many state laws and Army regulations also guide and initiate the activities of the installation environmental programs. Environmental assessments are initiated whenever a proponent proposes an action that may have significant environmental consequences. Spill recovery and waste cleanups are emergency actions triggered by events.

In the environmental area, major resource problems include lack of skilled manpower, especially on smaller installations, and difficulties in keeping up with changing environmental laws, regulations, and policies. Most installations expressed some concern and frustration over the installation restoration program, and needed technical help to write statements of work for controls. Installation environmental programs also experience difficulty in coordinating land maintenance and restoration activities with

training planners due to the intensive use of training lands. Currently, there is no Army-wide program for training in land restoration, despite serious problems in many areas.

Although many microcomputer-based data management applications, some developed locally and some developed at laboratories, are used to track and inventory hazardous materials and other resources, most installations expressed the need for additional data management capabilities. All CONUS installations make occasional use of the Environmental Technical Information System (ETIS) to keep up to date on environmental legislation and regulations and to prepare aspects of environmental assessments.

Every installation expressed the need for computer-based mapping and land analysis capabilities, although a few installations currently have such capabilities. Applications include map overlap functions for performing environmental assessments of complex, interacting landscape features, image processing functions to monitor landscape changes, and query functions to identify locations and information about polychlorinated biphenyl (PCB) transformers, hazardous waste dumps, endangered species protected habitat areas, etc.

Non-ADP needed improvements include:

- Better coordination between EN and Master Planning, especially in the early phases of project planning.
- Better education of troops concerning pollution abatement and environmental problems, especially as new units come and go. A coherent program in this area, that is consistent at all installations, would improve the success of these educational efforts. Troops moving from installation to installation would be exposed to similar information and procedures at each site.
- A broader variety of expertise. Only the larger installations have staff experts in each area (e.g., only about six installations have historians or archaeologists as historic preservation officers). To meet special expertise requirements, greater assistance is needed from MACOMs, DA, and/or Districts, or staffing needs to be increased on the smaller installations.
- Standard implementation of recycling programs. More could be done at every installation to recover wastes, reduce inputs to landfills, and monitor soil and groundwater conditions at landfill sites. Some installations generate thousands of dollars in revenue from recycling programs, and have thus been able to fund education, land restoration, and other efforts.
- Full implementation of the natural resource program suggestions of the 1984 Blue Ribbon Panel. Some have been implemented but others still await implementation. Few installation people are aware of the panel's report or recommendations. In general, natural resource programs are stronger and more comprehensive when integrated, organizationally with the environmental program. This was the case at Fort Sill, Fort McClellan, and Fort Bragg.
- Consolidation of Provost Marshal game warden functions with other fish and wildlife management functions. Advantages cited from this consolidation (already accomplished at Fort Sill) include: better control of hunting and fishing permits and access, improved wildlife harvest data, increased operational efficiency, and reduced costs.

10 TROOP OPERATIONS DIVISION

The Troop Operations (TO) Division serves as the principal DEH staff office for military engineering and troop activities. It is also the point of contact for mobilization activities including operations and other contingency plans.

Activities of TO include coordination of the engineer troop construction program, support to off-post locations, mobilization and other contingency activities, and operation of self-help programs in troop areas. This division is also the point of contact for tenant activities and other installation customers.

Management tasks performed by this office include:

- Planning and monitoring construction projects handled by troop units,
- Planning training for troop and reserve units,
- Managing the self-help programs, and
- Selecting work orders appropriate for troop training.

This division is responsible for inspecting and scheduling troop work and managing the logistics for troop projects and troop mobilization during a disaster. It is also responsible for coordinating with community officials during disasters and supervising construction inspection for community projects.

Major reporting duties include work order completion reports, final reports for each project, some internal reports, and weekly reports of support to all off-post locations. TO is also responsible for the 5-year program submitted to the MACOM, housing capability plan, mobilization requirements, environmental regulation waivers, Labor and Equipment reports, and internal self-help reports.

Work for TO is initiated by the troop Commander, family housing residents, inspectors, ERM work orders, Reserve Centers, and special community construction needs (Head Start, Boy Scouts, etc).

The resource problems include lack of telephone connections at OCONUS installations; untimely receipt of materials at project start date; and lack of funding for special items (construction requirements and specific tools) necessary for project completion.

Existing ADP tools being used in TO are FESS, FEJE, microcomputers to track IJOs and project status, and word processors. Additional microcomputer interfaces with systems such as FEJE and other supply systems would facilitate inquiries about the status of supplies. Electronic mail capability with troop units would improve the communication and coordination with this division. Microcomputers with graphics capability could be used to evaluate the impact of facility assignments on mobilization.

Other improvements include:

- Having a better historical record of troop projects,
- Higher design priority for Reserve Center maintenance projects.

- Better coordination with Supply Division to ensure material availability on project start dates, and

- BPAs and Indefinite Delivery Orders with suppliers to speed up the delivery of supplies. In addition, this office needs more freedom in buying equipment for troops since equipment often is rented for more than the purchase price.

11 ADMINISTRATIVE SERVICES DIVISION

The Administrative Services (AS) Division provides general administrative support to all elements of the DEH. These services include:

- Official mail distribution,
- Files maintenance,
- Records management,
- Time and attendance report maintenance,
- Travel, transportation, and training request processing,
- Suggestion and awards program administration, and
- Personnel action processing.

The major management tasks include:

- Supervising the distribution of mail within the DEH,
- Maintaining records of and processing requests for DA Pamphlets (PAMs), SOPs, technical manuals and ARs, and other regulations, and their updates,
- Maintaining files,
- Managing records,
- Issuing security clearances, and
- Controlling telephone communications.

The AS provides support to personnel for travel, training, and transportation requests. The division also maintains performance standards and manages the award and suggestion programs. Identification of physical requirements and workman's compensation reporting and management of the safety program is done by this division. Other general administrative work includes correspondence and word processing for other DEH elements.

Annual reports are prepared on problems such as deficiencies of recordkeeping, quality control of official mail, training needs, and injuries. Semiannual Table of Distribution and Allowance (TDA) reports are sent to the Directorate of Resource Management (DRM), then forwarded to DA. Quarterly reports are generated for training. Monthly reports include strength reports, position availability, overtime, copy machine, TDY funds, mileage of privately owned vehicles (POVs) and administration vehicles, sick leave and absence, awards, and the vacancy list. Additional reports are sent to the Division Chief concerning internal DEH information.

Administration work is mandated by regulations concerning personnel, travel and training, Division secretary requests, requests from the Civilian Personnel Office (CPO), or surveys.

A resource problem unique to AS is a lack of centrally located work areas for administration personnel. Also, there is a lack of training for Directorate of Personnel and Community Activities (DPCA) funded career interns; these people do not get training when funds are low. Other problems cited were a lack of manpower, lack of training, and the high turnover rate of personnel.

Many installations lack ADP tools. Those with microcomputers use them mostly for word processing, some data base management, and spreadsheets using commercial programs Lotus 1-2-3, WordPerfect, Wordstar, and Dbase III. Some installations had microcomputers but no personnel trained to use them.

A need for automation of records management and the ability to have CPO data bases available or integrated into AS by networking was commonly requested. They felt that the current system required much duplication of effort. The use of microfiche equipment would reduce space requirements for records. The automation of travel and training forms would increase efficiency. The ability to upload and download pertinent IFS data would also decrease duplication of effort.

Delegation of authority and responsibility is often difficult within AS due to the wide grade variation. This delegation problem needs to be better defined. Mail distribution delays would be alleviated by giving this responsibility to all administration divisions. Centralizing the AS and the travel office would decrease delays in these areas. Travel authorization should be decided at the Division Chief level. Customers could receive the best support from AS if these improvements could be implemented and the customers were informed.

12 SUMMARY

This report has presented a review of the different functional areas of several DEHs visited by the FEMS study group in Fiscal Year 1987 (FY87). General areas of concern have been identified for which solutions can be realistically expected only in the long term. These include lack of manpower and funding, the need to revise TDAs to facilitate hiring of qualified ADP personnel, and lack of incentives for retention of qualified staff. In the interim, DEHs will have to function more efficiently and productively with fewer people and smaller budgets. It would therefore seem productive to concentrate efforts on those areas of concern that may be effectively addressed in the short term. These include more extensive and up-to-date methods of conducting training, more extensive educational programs, development of ADP software for specific tasks at the DEH, better communication between the DEH Divisions, restructuring of existing DEHs to fit individual installation needs, and facilitation of ADP equipment acquisition.

One of the most important results gained from the installation visits is the amount of information that was gathered. The visits and lessons learned have acted as a springboard to identifying possible solutions for several of these areas of concern. In the area of training, for example, the new Directorate of Training which has been established at EHSC should set standards for training and facilitate the dispersion of information to the installations. The use of videotapes for self-help tasks/duties would cut expenses of travel and course attendance. Tasks such as hazardous material handling, pollution identification, and the segmented housing market analysis, could benefit from the development of computer assisted instruction (CAI) or expert systems.

As can be seen, there is considerable room for improvement at installation DEHs. In a time where efficiency and productivity are key ingredients for success, it is vital that ideas for improvement be identified and that strategic plans be set up for their implementation.

APPENDIX:

SITE VISITS TO MAJOR COMMANDS

Background

The Facilities Engineering Management System (FEMS) study was initially funded in Fiscal Year 1986 (FY86) to examine the existing management system, evaluate the tools (automated and nonautomated) used by the Facilities Engineer, and make recommendations on how to improve the productivity and performance of the Directorates of Engineering and Housing (DEHs) at Army installations. One of the major thrusts was to survey current automatic data processing (ADP) use and conduct installation visits to determine the information necessary to support the DEH tasks as defined in Army Regulation (AR) 5-10.¹ Numerous briefings were conducted on the outcomes of the research and members of the study group participated actively in the Requirements Analysis Procedures (RAP) that determined the information required for DEH activities in the development of the Integrated Facilities System-Mini/Micro (IFS-M).

During FY88 the study embarked on a macro analysis of the DEH to determine the major organizational factors that affected DEH management procedures. Site visits were conducted at Training and Doctrine Command (TRADOC), Forces Command (FORSCOM), and Army Materiel Command (AMC). A structured questionnaire (Annex 1) was used to interview Major Command (MACOM) and DEH staff. A representative from CEHSC-F attended the last two interviews to glean information to transfer to the Headquarters, DA/ACE MACOM STRAP which was held in November 1988. The interview information was evaluated to determine the current "as is" information flows through the organization. The final product of this meeting was a STRAP document presenting 120 issues involving the constraints on the information flow through the whole organization. Pursuant to these activities, the FEMS study group is now tasked to synthesize all the above information and make recommendations that will be used to guide policy changes.

Objective

These site visits had three major components. The first highlights relevant "inputs" (for example, the resources) required to efficiently and effectively conduct daily activities within the organization. The second examines the "processes" or in-house activities that are affected in either a positive or negative manner by the necessary or required inputs. In other words, how the business is conducted within the given constraints. The third section presents an examination of these processes or activities in their current setting--the "as-is" case--and examines two approaches that may be used to evaluate the impact of changes in the given "as-is" organization.

Approach

Existing pertinent information was reviewed by the survey team, consisting of the FEMS study group and Marya Leatherwood, a Professor of Organizational Behavior at the University of Illinois, Urbana-Champaign. A structured interview instrument was developed, pretested, modified and administered to six management personnel: three at MACOM level and three at the installation level. Five major concerns that the MACOMS have for their installations were identified. These are presented

¹Army Regulation (AR) 5-10, *Reduction and Realignment Actions* (Headquarters, Department of the Army, 26 August 1977).

in a graphic matrix (Figure A1). Projected visits were postponed due to the overlap of information collected at the HQ STRAP whereby the researchers deemed it more useful to synthesize existing data and integrate all aspects of analysis from existing sources. Future studies will focus on the management analysis underway by the FEMS study group.

Results

The respondents identified two major resources (inputs) necessary to conduct their daily activities in an efficient and effective manner. Surprisingly, these resources were not identified as financial (the allocation of funding) but rather involved the fundamental core of any business: human resources and information. Respondents reported that both resources, while available, were inappropriate in their current state, thereby constraining the organization's overall performance. Thus, the organizations sampled appeared (1) to have vast amounts of information and data that are costly to obtain and maintain but are not adequate for the efficient and effective execution of required activities, and (2) to be frustrated by the mismatch between their existing personnel and the manpower needed to perform the organization's mission.

Respondents identified several problems in the area of human resources which, in their opinion, constrained their units' performance. First, the types of manpower slots allocated to the units do not adequately reflect the activities and tasks required of personnel. As a result of manpower misclassification, a unit may be allowed to hire four "clerks" while the requisite tasks require one "clerk" and three "data entry personnel." Second, while the units may be able to provide "in-house" training for personnel to meet the required activities, once trained, these personnel may be hired by other employers or may be promoted into positions that offer wages commensurate with their data entry activities. Turnover of this nature affects training costs, increases the time required to obtain and maintain adequate data bases and decreases institutional knowledge within the unit. Several respondents indicated that the personnel who have the greatest impact on the information collected by the DEH often lack the correct training, have no career benefits, and are often married to military personnel who are on a 3-year tour of duty. Consequently, there is high turnover, no sense of ownership or job significance, and personnel have little or no incentives for superior job performance.

The human resource problems identified by respondents appear to be related to the information deficits experienced by the DEH. For example, personnel turnover in the DEH has resulted in the lack of collected and documented institutional knowledge. There has been little or no organized effort to retrieve, capture, and store this information from the resident experts. This has resulted in a vast amount of relearning and documenting information to keep the DEH operation functioning. This results in duplication of effort, inconsistencies and voids in information flows, lack of vision for the importance of each person's contribution to the flow, and inevitably chaos in this area.

One of the major mechanisms for collecting and processing the plethora of information has been the entry and maintenance of information that must be used for upward reporting. An automated system was developed in the early 1970s to facilitate this process--the Integrated Facilities System (IFS). The first increment of this system was IFS-1, which was originally designed to provide DA and MACOMs with support for their management activities by transferring and accumulating DEH/installation resources and cost information. The second increment was to support facilities planning and utilization, and the third was to facilitate tracking of large construction projects. In actuality IFS-1 was developed with three modules:

- Assets Accounting (AA)--designed to support installation real property inventory management,
- Facilities Engineering Management Systems (FEMS)--designed to support DEH management of facilities maintenance operations, and

- Real Property Maintenance Activities (RPMA)--designed to support the Planning, Programming, Budgeting, Execution, and Review Cycle (PPBER).

Unfortunately, at the time of deployment, IFS-1 was doomed to fail as the excellent DEH management tool it was conceived of being. Technology had already rendered the card, batch, and fixed records technologies of IFS-1 antiquated due to their lack of flexibility and their unfriendly user interface. This all contributed to the inflexible, labor intense, one-sided, ineffective, and inefficient interaction with IFS-1.

Respondents complained about the inaccessibility of the data and questioned its validity. Typical comments about the existing management information system included: information was not up to date; it contained redundant, erroneous data; the reports generated were too static and contained too much useless information; it was not interactive; it demanded too much labor intense data input; and it did not provide output in a timely manner. Other comments included the frustration of having to duplicate data entry into the many different systems that do not transfer data between themselves--no system interfaces existed. As a result, data often was not transferred to important systems. The users cut corners with their limited resources and had no horizontal communication, coordination, or ownership of data at the installation. Therefore, since the DEH personnel are often separated by this lack of communication as well as geographically, there is no cohesiveness in the installation data passed up to the MACOMs. Furthermore, after the information is passed to the MACOMs, respondents complained that the MACOM often summarizes, modifies, or rolls this information up to the next level, HQDA. The end result is that the individual installation's data is no longer accurately reported to HQDA.

Recommendations

The macro analysis clearly identifies that the DEH requires a structured information flow to adequately diagnose actions to be taken and to self-assess performance outcomes within the unit. To accomplish these activities, a comprehensive, integrated information system is required. The deployment of IFS-M will solve nearly all of the above information problems identified by respondents. Although the development of IFS-M has been slow and deployment hindered accordingly, work is continuing in many areas to provide the DEH with a management tool that will have the following capabilities over IFS-1:

- Integrated and Relational DEH Data Base--there is data consistency among functional areas, it also improves data integrity, reduces data base storage, improves system maintainability and allows generation of ad hoc queries.
- Interactive--information can be accessed from the data base using a terminal.
- On-line help screens--which reduce data entry errors, workload, training, and increase productivity.
- Telecommunication--IFS-M uses telecommunication links to other systems, ensuring more timely and reliable data transfer.
- On-line environment--this improves customer support and supports decisionmaking processes.
- Greater system availability--using current technology (a UNISYS 5000 series) allows the system to be fully supported.

- Stand-alone microcomputer applications--IFS-M system allows easy interfacing/integrating capabilities with other microcomputer applications thus making more efficient use of the minicomputer. IFS-M becomes the "corporate data base," reducing the processing load on the minicomputer, and allows information to be accessed even if the minicomputer is down.

- Reduced data entry requirements--since many data elements of IFS-1 transactions have been made optional, IFS-M will reduce data entry errors, eliminate duplicate data entry, and ultimately increase user productivity.

- Reduction of hard copy reports--IFS-M replaces many IFS-1 reports with on-line interactive queries resulting in more efficient computer use.

- System portability--there is an increase in system portability since IFS-M uses Oracle and SQL, and offers an increase in growth potential.

The macro analysis, however, also indicated that the deployment of IFS-M cannot be accomplished without giving attention to the human resource issues. That is, a comprehensive data base cannot be created nor maintained without personnel who have not only the requisite skills but also a vision of their overall importance in the organization. Short tenure spans and substandard wages are certainly two factors that will continually constrain the ability of the DEH to attract and retain such vital manpower.

Finally, the impending trend toward commercial activities (CAs) has significant implications for the DEH performance, given the information and human resource identified in this analysis. If the CA are an inevitable fact the DEHs will be required to contend with, the units must be prepared to "streamline" and transfer the necessary information to the contracting organization as optimally as possible. A comprehensive and integrated information system, such as that described above, will not only facilitate such transfer, but also allow for the real-time evaluation of contractor performance which will be crucial to the success of the DEH. Such evaluation strategies will also allow for a cost benefit analysis to be conducted over time so that HQDA, the MACOMs, and the DEHs are adequately prepared to reevaluate and implement alternative staffing arrangements if deemed appropriate. This will also be the added motivation to optimally use the capabilities of the current management system, IFS-M.

ANNEX 1: QUESTIONNAIRES

Detailed Questionnaire

1. The primary mission of the Directorate of Engineering and Housing (DEH), according to Lieutenant General Heiberg III "is to provide quality, responsive engineering and housing operations and maintenance support for installations to carry out defense missions effectively in peacetime and in war."

What additional missions or responsibilities do the DEH have and how do these affect this primary mission?

2. What is your organization? (Please check one.)

☐ DEH/DFE/DEL

☐ MACOM

☐ HQDA/Engineering Housing Support Center (HQDA/EHSC)

3. What do you feel is the primary role of each of the following organizational elements? Please include major decisions made at each level.

a. DEH/DFE/DEL

b. MACOM

c. HQDA/EHSC

4. Considering the following resources what critical problems do you have with each:

Funding:

Facilities:

Equipment:

Authority:

Manpower:

Skills:

Contracts:

Training:

ADP:

Other, please specify:

- 5a. What current information is critical for your organization to fulfill its reporting responsibilities? (e.g., BMAR, COB)
- 5b. What current information is critical for effective management of your organization? (e.g., Repair and Maintenance, Red Book)
6. What factors currently limit or constrain the performance of your organization?
7. What indicators would you consider in measuring the performance of the following FE organizational elements?
 - a. DEH/DFE/DEL
 - b. MACOM
 - c. HQDA/EHSC
8. What would you like to see as the "ideal" or the most efficiently and effectively managed FE organization?
9. In your most efficient management system, what roles would the following organizational elements play? Please include major decisions made at each level.
 - a. DEH/DFE/DEL
 - b. MACOM
 - c. HQDA/EHSC

10. Please add any additional recommendations, suggestions, or comments regarding improvement of the FE organization. Please include any additional information that would contribute to improving your role in this organization.

Summary Questionnaire

1. What criteria do you use when evaluating the performance of the DEH?
2. Why are these criteria important?
3. Do these criteria differ from the criteria that could be or are being used to evaluate the performance of the DEH?
4. When, if ever, have you changed the criteria you use to evaluate the performance of the DEH? Why did you change your criteria?
5. In your opinion, what organizational factors (such as organizational structure, technology, human resources, budget, CA) affect the performance of a DEH?
6. What is your vision for the DEH of the future?
7. What steps can a DEH take to achieve this vision?

	TRADOC	FORSCOM	AMC
Contract Administration	<ul style="list-style-type: none"> ● loss of institutional knowledge ● reduction of flexibility ● loss of control ● interface between contractors and in-house staff 	<ul style="list-style-type: none"> ● need well defined governmental priorities ● concern about dependency on government function ● need a team approach and consensus ● loss of journeyman expertise 	<ul style="list-style-type: none"> ● loss of institutional knowledge ● reduction of flexibility ● QAE/COR--who is where, define functional location ● need to identify residual staff and their responsibilities ● must retain control regardless of loss of flexibility
Human Resources	<ul style="list-style-type: none"> ● loss of personnel ● low pay grades ● no incentive to advance position ● lack of horizontal training ● lack of funding for adequate training 	<ul style="list-style-type: none"> ● loss of personnel ● loss of personnel influences and invalidates performance work statement (PWS) ● loss of energy monitoring function expert ● emphasis on "year of training" ● need delegation to commanders ● need to deal in missions not projects 	<ul style="list-style-type: none"> ● loss of personnel (3 of 43 to EHSC) ● CPO must create multiskill slots ● need to encourage a "plant manager" concept
Installation Facilities Systems - Mini, Micro	<ul style="list-style-type: none"> ● need horizontal information flow ● need resident trainer ● need qualified operator ● need interface ● concern about use by contractors because of minimum security ● concern about system using "old" technology ● concern about conversion process ● lack of onsite and sustainment training 	<ul style="list-style-type: none"> ● need horizontal information flow ● need to safeguard allocated money for deployment ● need \$4.3 million for IFS conversion 	<ul style="list-style-type: none"> ● as this is first IFS deployment to AMC (no IFS-1), employees are less experienced ● concern that problems in other MACOMs will be more intense for AMC ● need small residual staff to maintain records ● concern about large interface problem between many "homegrown" systems ● concern about use of IFS-M by contractors ● concern about system using "old" technology
Review & Analysis	<ul style="list-style-type: none"> ● need comparisons of job estimates ● need comparisons with other installations in the same and different MACOMs ● need comparisons of SOs by person, trade, task hour ● need analysis of backlog by manpower and trade 	<ul style="list-style-type: none"> ● need job grade level comparison ● need comparisons with other installations in the same and different MACOMs ● need to use 3-point condition index/scale (low rated ones don't get reinspected) 	<ul style="list-style-type: none"> ● need to improve initial attempt to compare R & A functions/analysis across installations in same MACOM and different MACOMs ● need a method to compare four major fund sources and installations' individual weapons requirements ● need to determine better priorities for funding ● need to evaluate CA and document/distribute lessons learned
Environmental	<ul style="list-style-type: none"> ● hazardous materials, radon, asbestos removal, leaking underground storage tanks, and landfills ● concerns about wastewater treatment plants ● implementation of more proactive training in area land management 	<ul style="list-style-type: none"> ● need to meet EPA and State requirements with minimum activity ● hazardous materials, radon, asbestos removal, leaking underground storage tanks, and landfills 	<ul style="list-style-type: none"> ● Environmental is a major part of this MACOM's mission. ● need to inventory hazardous waste ● need to know who is in charge, EPA or State ● need to know what criteria to work with ● concern about lack of PM currently reaction/need, need to be proactive vs reactive ● concern about industrial pollution problem

Figure A1. Matrix of MACOM concerns expressed during site visits.

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